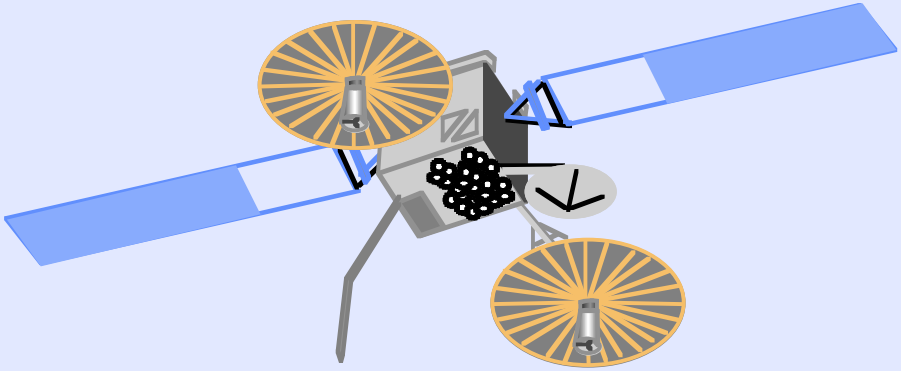
Interference to the TDRS-H,I,J System from the Fixed Service, Mobile Service, Fixed Satellite Service, and Inter-Satellite Service



Second Ka-Band Utilization Conference
September 24 - 26, 1996
Florence, Italy

Linda Harrell (STel),
Badri Younes (NASA CLASS Project Manager)

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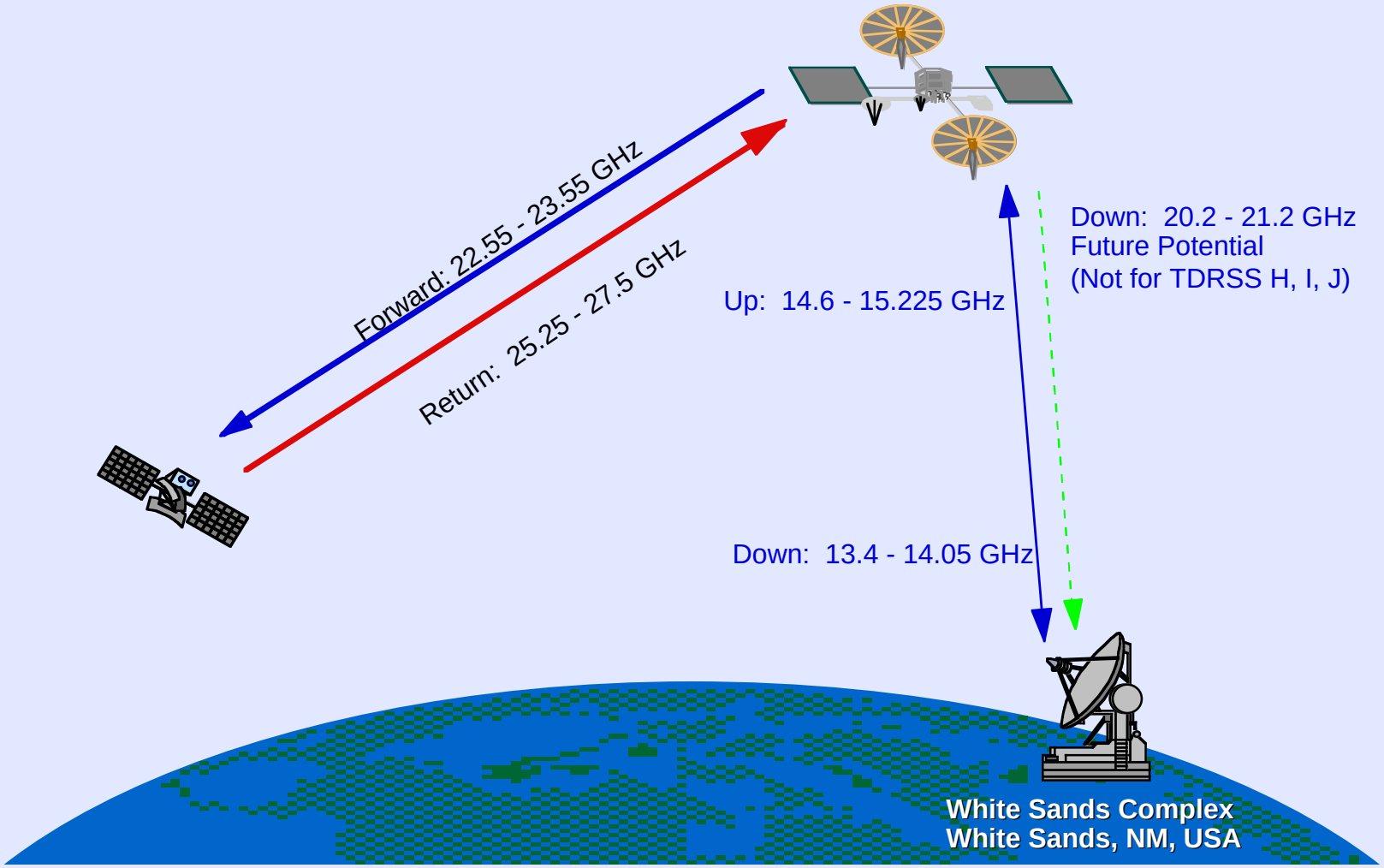
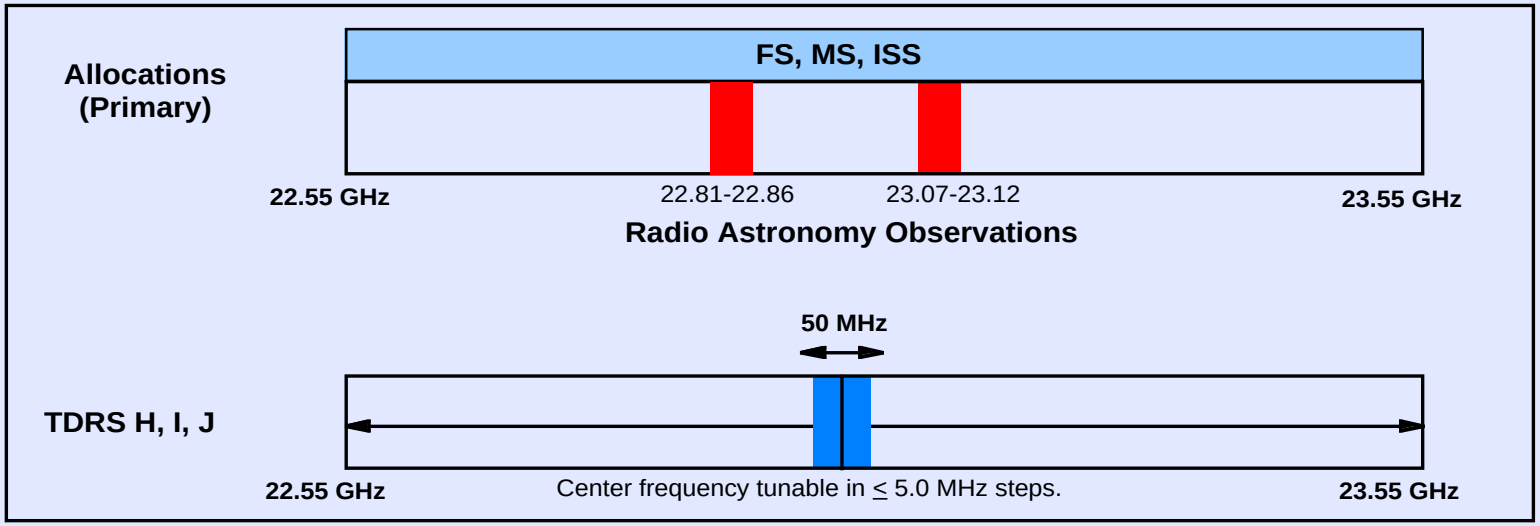
Introduction

- NASA, ESA, and NASDA Data Relay Satellites (DRSs) will be operating Inter-Satellite Links (ISLs) in the following bands:
  - Forward Band: 22.55 - 23.55 GHz for DRS to LEO user spacecraft ISLs
  - Return Band: 25.25 - 27.5 GHz for LEO user spacecraft to DRS ISLs
- DRS ISLs will be susceptible to interference from
  - Fixed Service (FS)
  - Mobile Service (MS)
  - Fixed Satellite Service (FSS)
  - other ISLs

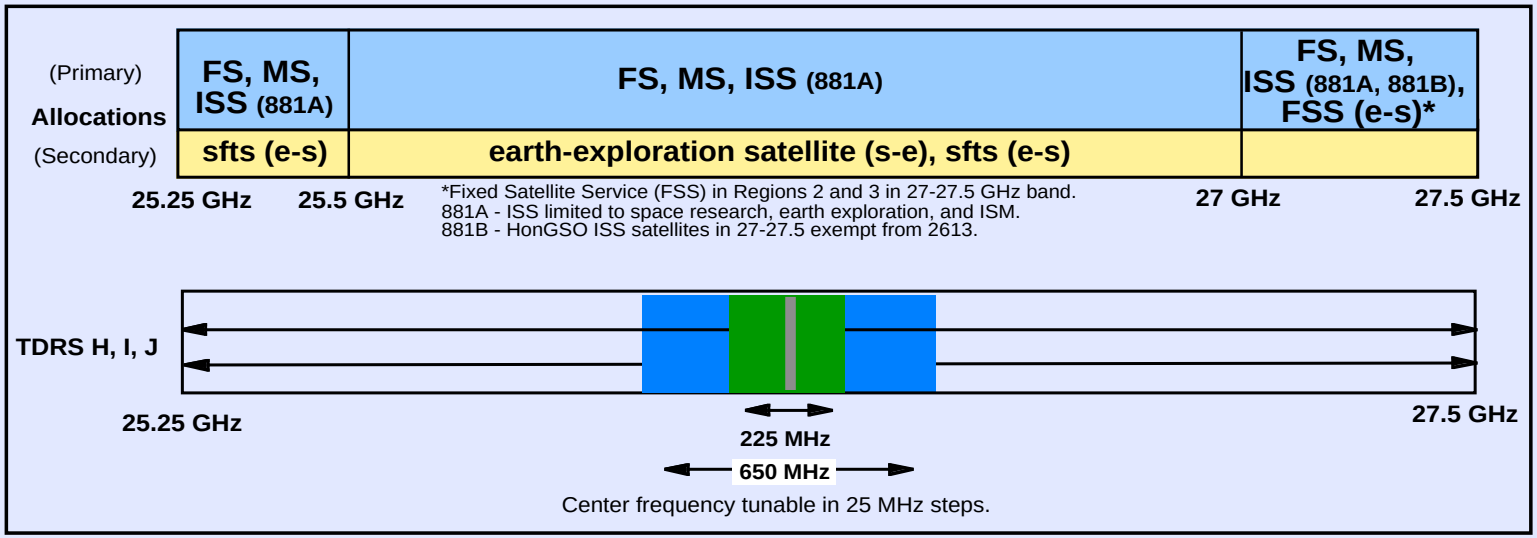
TDRSS Planned Use of Ka-Band



Frequency Allocations & Usage



Forward ISL



Return ISL

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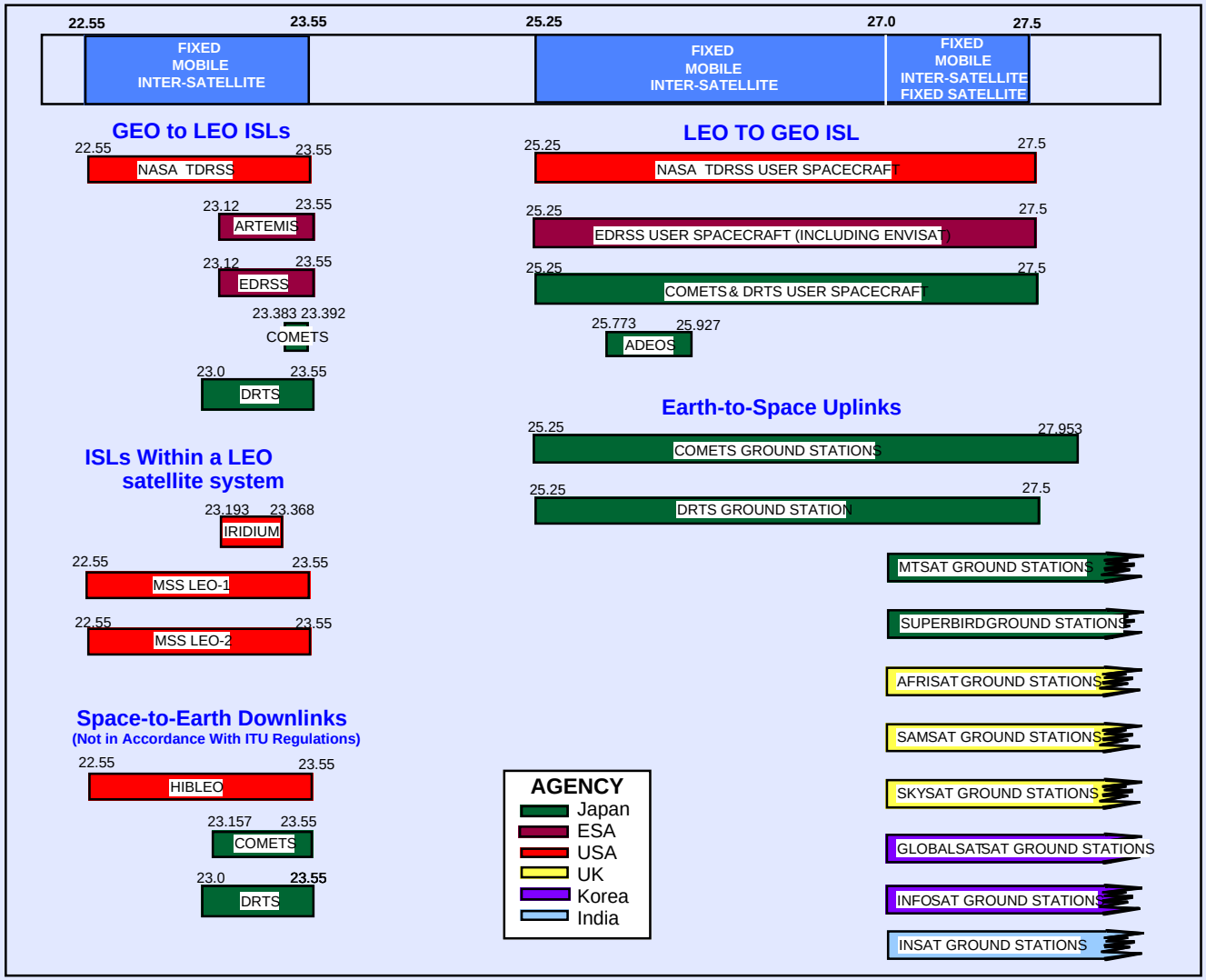
Outline

- Interference Environments
  - Other Satellite Systems
    - » Forward and Return Band
  - Terrestrial FS Systems
    - » Forward Band
    - » Return Band
      - ¤ Point-to-Point (P-P)
      - ¤ Point-to-Multipoint (P-MP)
- Simulation Tools
- Sample Results

Satellite Systems Operating in TDRSS Bands



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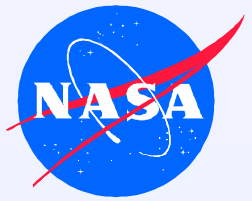
Terrestrial FS Interference

- Forward Band
  - Characteristics of the FS station emissions are summarized in Recommendation ITU-R F.758
- Return Band
  - P-P
    - » Protection of DRSs from the emissions of FS stations is being studied by ITU JAH
    - » JAHWP 7B-9D is developing a recommendation to limit FS emissions in the direction of specific DRS orbit locations
    - » See “Technical and Operational Considerations That Should Be Adopted by the Fixed Service to Facilitate Sharing With the Inter-Satellite Service in the Frequency Band 25.25 - 27.5 GHz”

Terrestrial FS Interference (Cont)

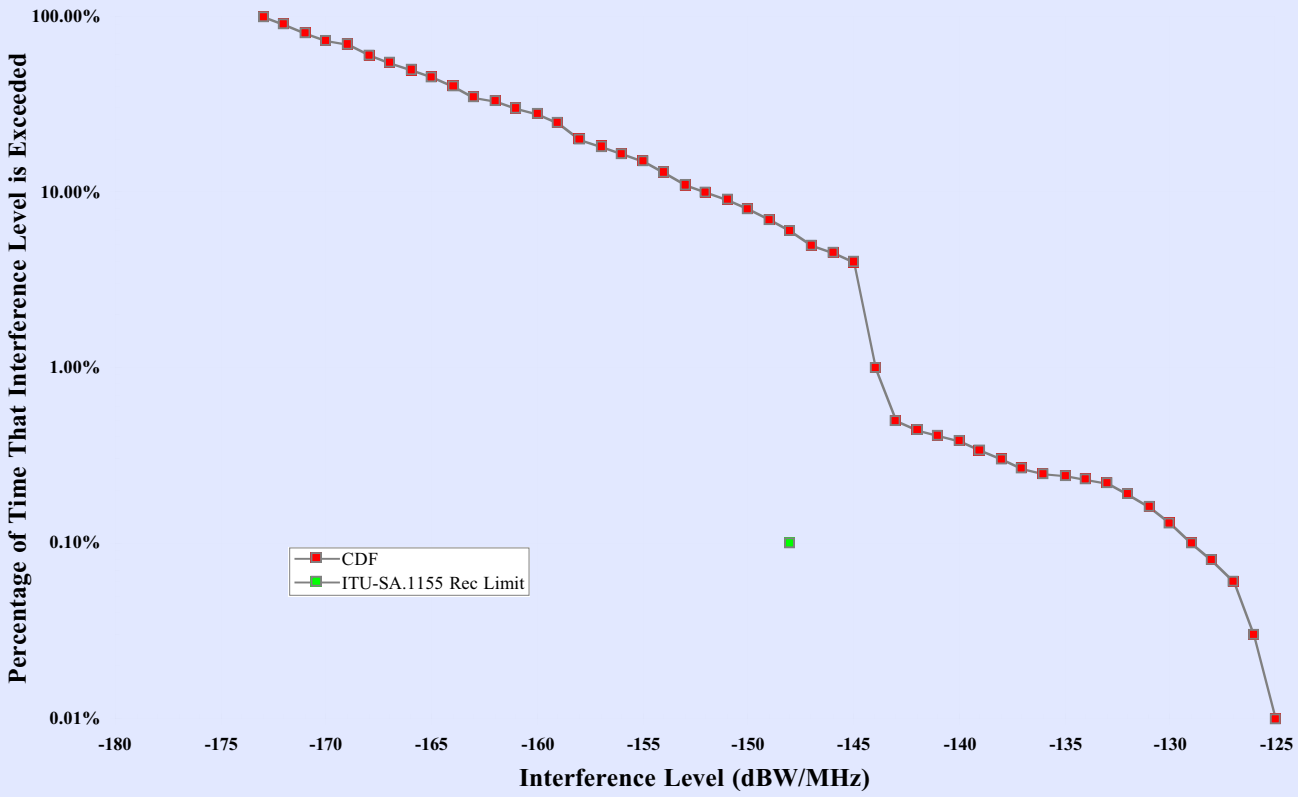
- **Return Band (Cont)**
  - **P-MP**
    - **Certain types of Local Multipoint Communication Systems (LMCS)/Local Multipoint Distribution Systems (LMDS) cause less interference than other types**
      - **Low power LMCS/LMDS cause unacceptable interference to DRSs at low elevation angles**
      - **Higher power LMCS/LMDS cause unacceptable interference to DRSs at all elevation angles**
    - **NASA supports ITU studies to determine the characteristics of LMCS/LMDS systems that can share with DRS systems**

CLASS Project



- The NASA GSFC Communications Link Analysis and Simulation System (CLASS) Project provides resources for evaluating the performance of space communication links for
  - NASA's Space Network (SN), Ground Network (GN), and Deep Space Network (DSN)
  - and other agencies
- CLASS project developed
  - interference environment models for TDRSS ISLs
  - software tools to assess communications performance
    - » CAGE
      - ¤ discussed in separate presentation
    - » Other Simulation Tools
      - ¤ Assess effects of terrestrial interference and scattering

Sample Result



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